

Nov. 27, 1951

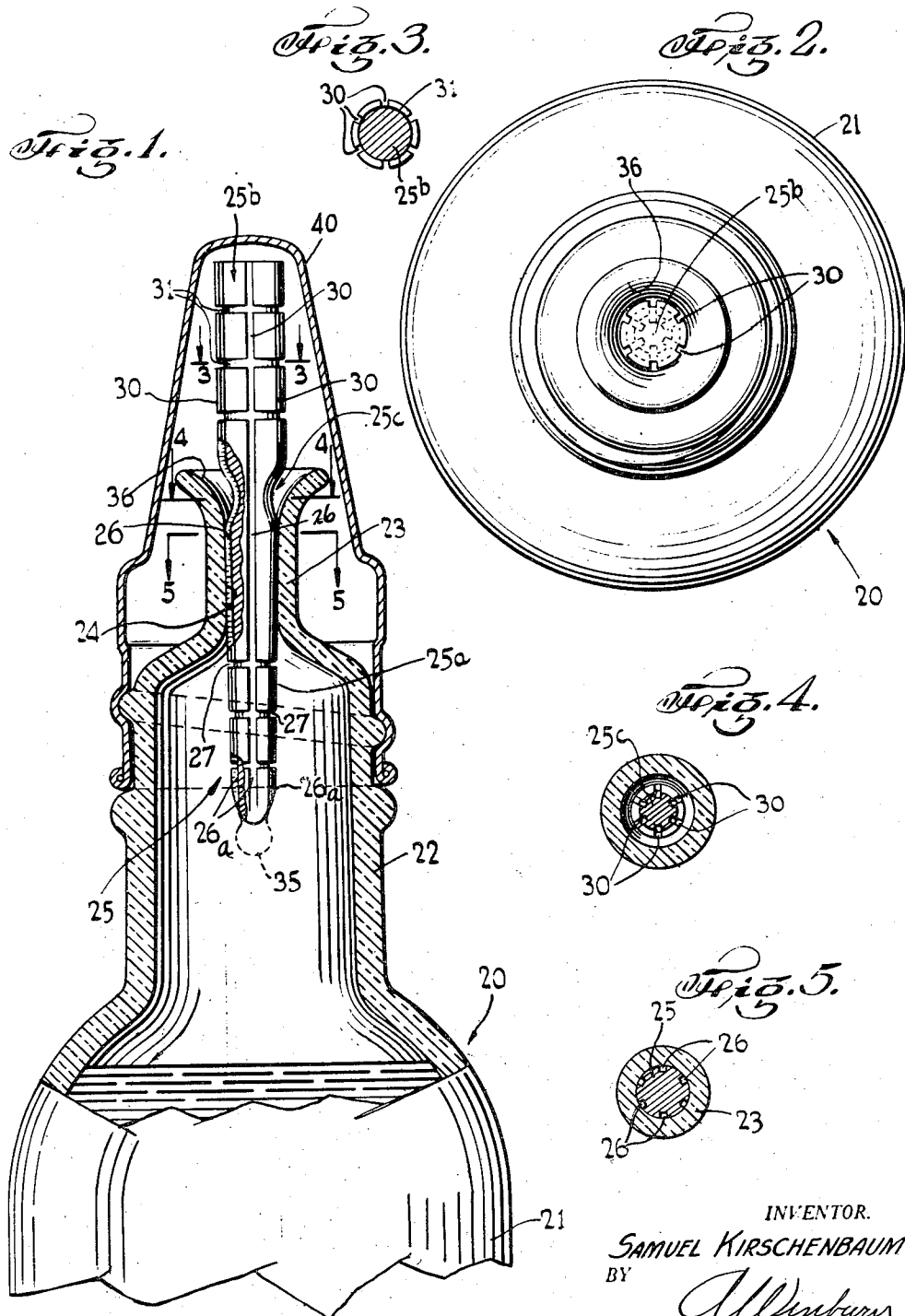
S. KIRSCHENBAUM

2,576,403

DROP DEVICE

Original Filed Jan. 1, 1942

2 SHEETS—SHEET 1



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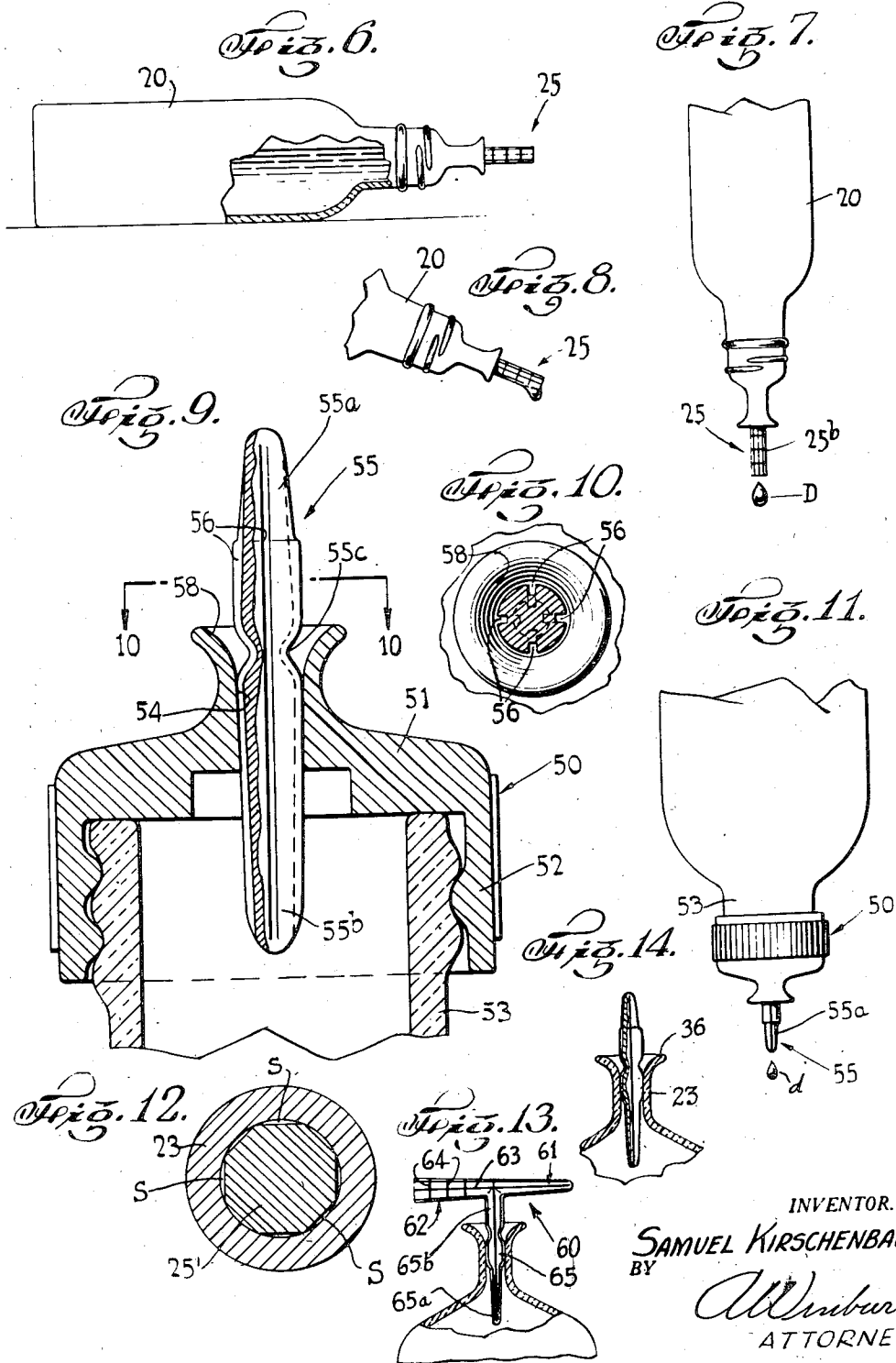
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2 SHEETS—SHEET 2



UNITED STATES PATENT OFFICE

2,576,403

DROP DEVICE

Samuel Kirschenbaum, Brooklyn, N. Y.

Continuation of application Serial No. 425,274,
January 1, 1942. This application July 9, 1945,
Serial No. 603,818

8 Claims. (Cl. 222-421)

1

This invention relates generally to drop devices. More particularly, my invention relates to an improved construction for automatically acting drop bottles and the like.

One of the objects of my invention is to provide a highly improved construction for a drop bottle or similar article of the class described, in which the liquid from a bottle or similar container may be automatically dispensed in the form of uniform sized drops by inverting or tilting the bottle and in which such drops may be controlled as to size and rate of flow.

Another object of my invention is to provide a drop bottle of the class described in which the liquid dispensed from the bottle in the form of drops will be prevented from overrunning to the outer surface of the said bottle thereby maintaining the bottle or container in clean, dry state at all times.

Still another object of my invention is to provide a drop device of the class described having means for controlling the flow of liquid from a bottle or similar container and which is adapted for use in connection with any standard form of bottle or similar container now in use.

A further object of my invention is to provide, in a drop bottle of the class described, means whereby the unused or excess liquid will be automatically drawn back into the bottle when the said bottle is placed in normal upright position after use.

Still another object of my invention is to provide an improved drop bottle construction of the class described which shall be characterized by the simplicity of its parts and the ease of assembly thereof; which shall be relatively inexpensive to manufacture; which shall be characterized by the positiveness and precision of its action at all times and which shall represent a great improvement in the art of drop devices.

Other objects of my invention will in part be obvious and in part hereinafter pointed out.

This application is a continuation of my co-pending application, Serial No. 425,274, filed January 1, 1942, for Drop Devices which is now abandoned.

The invention accordingly consists in the features of construction, combinations of elements or parts which will be exemplified in the constructions hereinafter described and of which the scope of application will be indicated in the claims.

In the accompanying drawings, in which is shown a number of the various possible embodiments of this invention:

2

Fig. 1 is an enlarged vertical sectional view of the upper portion of a drop bottle constructed and arranged in accordance with my invention;

Fig. 2 is a top plan view thereof with the protective covering removed;

Figs. 3, 4 and 5 are cross-sectional views taken substantially on the lines 3-3, 4-4, and 5-5 of Fig. 1;

Fig. 6 is an elevational view, partly in section, of the Figs. 1 to 5 form of my invention and illustrating the operation thereof;

Figs. 7 and 8 are fragmentary elevational views thereof, illustrating the manner in which my invention is used;

Fig. 9 is a vertical sectional view, partly in elevation and similar to Fig. 1, but illustrating a modified form of my invention;

Fig. 10 is a cross-sectional view taken substantially on the line 10-10 of Fig. 9;

Fig. 11 is a fragmentary elevational view, similar to Fig. 7, but illustrating the manner of use of the Figs. 9 and 10 form of my invention;

Fig. 12 is a cross-sectional view, similar to Fig. 5, but illustrating another modified form of my invention;

Fig. 13 is a vertical cross-sectional view similar to Figs. 1 and 9 but illustrating still another modified form of my invention; and

Fig. 14 is a cross-sectional view similar to Figs. 1, 9 and 13 but of reduced size and illustrating a further modification of my invention.

In the type of drop bottles or similar devices heretofore manufactured, certain disadvantages of construction were found to be inherent therein. For example; in addition to the irregularity of flow, neither the speed nor the size of the drops could be controlled. It was also found that after use, the liquid from the bottle would smear over the mouth of the bottle as well as the outer surface thereof. This would result in damage to furniture or other articles upon which the bottles were placed. When oils were used the container became particularly messy. Another disadvantage was found in the fact that should the bottle be accidentally tipped over, the liquid therefrom would spurt from the opening much to the annoyance and discomfort of the user.

By my invention, soon to be described, I have been able to overcome the above described disadvantages and to provide an improved drop bottle having at the same time many additional advantages not present in prior constructions.

Referring now in detail to Figs. 1 to 8 of the drawings, I have shown a drop device constructed

3

and arranged in accordance with my invention and comprising generally a container for liquids, such as oil, acid, perfumes, etc., which in this case I have shown, for purposes of illustration, in the form of a bottle 20. The said bottle 20 may comprise, in addition to the main body portion 21, the usual narrow neck portion 22. Integral with and extending from the neck portion 22 is a further constricted portion 23 forming an opening 24 for the bottle. Into this opening 24 there is received and held by friction or by any other known means, an elongated plug member 25 made of any suitable material, such as, metals, plastics and the like which are impervious to the type of liquid contained in the bottle and which it is desired to dispense in drop form. Glass has been found to be very satisfactory. The plug member 25 may comprise a portion 25a extending within the bottle, a portion 25b extending outside of the bottle and preferably interconnected by a constricted neck portion 25c, the purpose and function of which will soon be explained.

It is understood that in order for the liquid in the bottle to be dispensed therefrom in the form of drops it is necessary that there be some passageway or egress for the liquid. To this end and in accordance with my invention, I have found that satisfactory results are obtained by providing a predetermined amount of space between that portion of the plug member part 25a which is in contactive engagement with the wall surrounding the opening 24. One method of providing such space is by forming the plug member part 25a with longitudinal open capillary grooves 26 (see Figs. 1 and 5) in the outer surface thereof. Thus it is seen that when the bottle is tilted or turned upside down for use, a certain amount of the liquid will be permitted to pass from the bottle through the passageway formed by the grooves 26 to be drawn out and to collect on the outwardly extending plug part 25b from whence it will ultimately fall off in the form of drops.

While in the drawings, I have shown that part of the plug number 25 which engages the opening 24 to be of circular cross-sectional contour, to conform to the shape of the bottle opening 24, and as having six circumferentially spaced vertical grooves 26, it is understood that the said plug part as well as the opening 24 may be of any desired cross-sectional shape, and that any desired number of grooves may be employed disposed in any direction, an essential part of the above described construction being that there be provided some capillary space between the plug member 25 and the opening 24 for the passage of air and/or fluid. It is also here noted that if desired the opening 24 may be slightly tapered and the plug member part 25a also tapered to maintain the same in proper position and to prevent the plug member 25 from slipping through the opening 24 and at the same time to obtain a better grip.

In Fig. 12, I have shown another means for obtaining the desired space between the plug member and the bottle opening into which it is received. In this Fig. 12 form of my invention, I have shown the opening 24 as having the same circular cross-sectional shape as that shown in Fig. 1, but the plug member 25 instead of conforming in cross-sectional contour is made dissimilar, in this case of octagonal contour. A plurality of spaces or capillary passageways S for air and fluid are thus provided.

4

In accordance with my invention, I have found that I am able to alter, or in other words control the rate of flow of the liquid from the bottle by altering the total amount of space between the plug member and the adjacently disposed wall of the bottle opening. I have found that the larger the said total amount of space, the faster the rate of flow of the liquid, and that the smaller the said total amount of space, the slower will be the rate of flow. This is true up to certain limits, of course, and is dependent upon the type of liquid used.

Thus for example, the three different drop bottles constructed as illustrated in Figs. 1, 12 and 14 will each dispense drops at a different rate of speed or flow. In Fig. 12, a larger total space than in the Fig. 1 is provided, while in the Fig. 14 form the total space is decreased by shortening the length of the passageways.

I have also discovered that by making the plug part 25b, which extends outside the bottle, of slightly enlarged size with respect to the remainder of the plug I can retard the time when there will be sufficient liquid collected on the plug part 25b to form the first drop which will ultimately fall therefrom by the force of gravity.

My invention also contemplates the provision of a chain of open capillary grooves on the outer surface of the outwardly extending plug portion 25b, the said chain comprising the grooves 30 and 31 interconnected with each other. In accordance with my invention the said interconnected chain grooves 30 and 31 communicate directly with the capillary passageways 26. One effect of the above described arrangement of grooves is that of holding the liquid on the plug part 25b, so that the said liquid will be prevented from forming into a drop and from falling off at any point except the area adjacent to the extreme tip of the said plug part 25b.

If desired a similar chain of interconnecting open capillary grooves comprising the grooves 26a and 27, may be provided in the outer surface of the inwardly projecting plug portion 25a, the said chain of grooves communicating directly with capillary passageways 26. By such construction, I have found that when the bottle 20 has been restored to its normal upright position, after use, the capillary grooves 26a and 27 connecting with the capillary passageways 26 will draw the liquid remaining on the plug downwardly to ultimately drop off and return to the liquid contents of the bottle as illustrated by the drop 35 shown in dotted lines in Fig. 1 of the drawings.

To prevent any of the liquid contents of the bottle from overrunning to the outer surface of the neck and body of the bottle during and after use thereof the following construction is provided. The opening 24 of the bottle 20 is made to terminate in an outwardly flared rim 36. This flared rim is so designed as to be turned away from the drop and not to cut the same at any time. In addition to the flared rim 36, the neck portion 25c of the plug member 25 may be disposed in the area of the said flared rim 36. It is thus seen from the above described construction that when the bottle is tilted or turned for effective use, as for example, in the manner shown in Fig. 8 of the drawings, liquid from the interior thereof will pass through the passage grooves 26 to the outer plug part 25b. The capillary grooves 30 and 31 will break the surface tension of the emerging liquid and cause the same to cling to and flow on the plug part 25b.

5

The enlarged space surrounding the plug part 25b formed by the flared end 36 of the opening 24 and the neck 25c will prevent any accumulation of liquid on the rim of the flared end 36 and thus prevent any of the liquid from overflowing to undesired areas of the bottle. Similarly when the bottle is placed in upright position again, the liquid remaining on the plug part 25b will flow back, due to gravity and to capillary action, along the plug member 25. It is also noted that when, due to the above described construction of the plug member and the arrangement of capillary grooves thereon, the bottle 20 is caused to be on its side, such as, for example, as shown in Fig. 6 of the drawings, no liquid will escape from the bottle.

It is thus seen that a drop bottle constructed in accordance with my invention and as above described may be placed upon any table or other surface without fear of damage to the said surface.

If desired the drop bottle of my invention may be provided with a protective cap of any suitable construction and design to prevent dust from collecting on the plug member part 25b and, in the case of volatile liquids, to prevent evaporation.

Any suitable means may be employed for attaching the cap 40 to the bottle, such as, by threading the exterior of the neck portion 22 of the bottle and correspondingly threading the inner surface of the bottom edge of the cap.

While in Fig. 1, I have shown my invention as applied to a container or bottle in which the flared neck opening is integral with the body of the bottle, it is understood that my invention may be satisfactorily practised with a construction in which the flared neck opening may be in the form of a separate unit attached to or built into the usual type of cork closure which in turn may be inserted in the opening of the standard form of bottle in the well known manner.

In Figs. 9 and 10, I have illustrated a modified form of my invention in which instead of the integral flared neck of the bottle shown in the Fig. 1 form of my invention or in the above described method employing a cork stopper, I prefer to use a removable cap unit 50 which may be received on the threaded neck of any standard type of bottle now in use.

Referring now to Figs. 9 and 10 there is shown such cap unit 50 constructed in accordance with my invention and comprising a cap member having a top wall portion 51 and a depending peripheral wall 52 provided with internal threads adapted to be threadedly received on the threaded neck portion 53 of any standard type of bottle. The top wall 51 is provided with a vertically disposed central opening 54 similar in purpose and function to the bottle opening 24. Into the opening 54 there is received a plug member which may be of the same type or construction as the plug member 25 or which may be of the type, indicated by the numeral 55 in Fig. 9, and comprising the parts 55a and 55b interconnected by a narrower neck portion 55c. The said plug member may be provided with suitably arranged capillary grooves 56 serving the same purpose and function as the grooves 26, 26a, 27, 30 and 31. To prevent the liquid from running over to the outside of the bottle during use I provide the opening 54 with a flared rim portion 53, similar in function and purpose to that of the flared rim 36.

I have also discovered that by altering the

6

shape and size of the outwardly extending part of the plug member, I am able to change the size of the drops dispensed. Thus, for example, with the type of plug member part 25b employed in the Fig. 1 form of construction, I obtain a more or less standard size of drop D such as, for example, that illustrated in Fig. 7. However, by constructing the extending plug member part 55a as in the Figs. 9 and 14 form of my invention, I obtain a split drop, or a drop d of smaller size, such as, for example, that illustrated in Fig. 11 of the drawings.

It is noted that in both of the Figs. 1 and 9 forms of my invention the plug member may be readily removed and replaced for any desired purpose such as for cleaning or renewal.

If desired a protective cap, similar to the cap 40, may be employed in connection with the Fig. 9 form of my invention, in which event the outer surface of the depending wall 52 may be threaded to receive the same thereon.

In Fig. 13, I have shown a modified form of my invention in which I have so designed my plug member that I may selectively obtain different sizes of drops from the same bottle.

In this form of my invention any suitable type of container may be employed, such as, for example, that shown in Figs. 1, 9, or 14 with the same type of outwardly flared opening. The plug member 60, however, comprises a vertically disposed part 65 having a portion 65a thereof extending inside of the bottle and a portion 65b extending outside of the bottle. The space between the bottle opening and the plug member part 65 may be provided by capillary grooves similar to the grooves 26. Instead of permitting the liquid to fall from the plug member part 65b in the form of drops, I provide an integral horizontal part comprising the portions 61 and 62. The part 62 is larger than the part 61, so that if it is desired to dispense standard size drops D, the bottle must be tilted with the said part 62 pointing downwardly. Similarly, when it is desired to use smaller drops d, the bottle must be tilted with the part 61 pointing downwardly.

Capillary grooves 63 and 64 may be provided on the plug member parts 61 and 62 similar in purpose and function to that of the capillary grooves 30 and 31.

In accordance with the provisions of the patent statutes, I have herein described the principle and operation of my invention together with the constructions which I now consider to represent the best embodiments thereof, but I desire to have it understood that the constructions shown are only illustrative and that the invention can be carried out by other means. Also, while it is designed to use the various features and elements in the combinations and relations described; some of these may be altered and others omitted without interfering with the more general results outlined, and the invention extends to such use.

Having described my invention, what I claim and desire to secure by Letters Patent is:

1. In a drop dispensing device of the character described, a container for liquids having a discharge opening, a one piece plug member in said discharge opening, said plug member having a portion thereof extending beyond said discharge opening, the portion of said plug member in said discharge opening being of such cross-sectional contour with respect to said opening as to provide a space therebetween through which, when the container is tilted, liquid will flow so

that liquid from the container may pass to the surface of the said extending plug portion to ultimately fall off therefrom in the form of drops, said upwardly extending plug portion comprising a portion disposed transversely of the said upwardly extending portion, said transverse portion having two ends of different sizes so that different sizes of drops may be selectively dispensed therefrom, said extending plug portion being provided with at least one open capillary groove in the surface thereof, said groove communicating directly and at all times with said space between said plug member and said opening, the wall of said discharge opening surrounding said plug member terminating in an upward and outwardly flared portion whereby the liquid will be prevented from passing to the lip of the container and will stay on said outwardly extending plug portion to be dispensed therefrom.

2. In a drop dispensing device of the character described, a container for liquids having a discharge opening, a one piece plug member in said discharge opening, said plug member having a portion thereof extending beyond said discharge opening, the portion of said plug member in said discharge opening comprising at least one capillary groove in the surface thereof communicating with the interior and with the exterior of the container to provide a path through which, when the container is tilted, liquid will flow so that liquid from the container may pass to the surface of the said extending plug portion to ultimately fall off therefrom in the form of drops, said extending plug portion being provided with a chain of open capillary grooves in the surface thereof, each groove of said chain of grooves connecting directly with another groove of said chain, and at least one groove of the said chain of grooves communicating directly and at all times with said capillary groove in said plug member portion in said discharge opening.

3. A drop dispensing device according to claim 2 in which the said discharge opening surrounding said plug member terminates in an upward and outwardly flared portion.

4. In a drop dispensing device of the character described, a container for liquids, said container having a normal opening, a closure member for said opening, said closure member having an opening smaller in size than said normal opening to serve as a discharge opening, a one-piece plug member frictionally held in said discharge opening, said plug member having a portion thereof extending beyond said discharge opening, the portion of said plug member in said discharge opening being of such cross-sectional contour with respect to said opening as to provide a space therebetween through which, when the container is tilted, liquid will flow so that the liquid from the container may pass to the surface of the said extending plug portion to ultimately fall off therefrom in the form of drops, said extending plug portion being provided with a chain of interconnecting open capillary grooves in the surface thereof, the said chain of interconnecting grooves communicating directly and at all times with said space between said plug member and said opening.

5. In a drop dispensing device of the character described, a container for liquids, said container having an opening, a plug member in said opening, said plug member having a portion thereof extending outside of said container, the portion of said plug member in said opening being of such cross-sectional contour with respect to said

opening as to provide a space therebetween through which, when the container is tilted, liquid from the container may pass to the surface of the said extending plug portion to ultimately fall off therefrom in the form of drops, said plug member being provided with a portion extending below said opening to a point within said container whereby when the container is held upright after use, the liquid remaining on the plug member will pass to said last named extending plug portion within said container to fall off therefrom by the force of gravity and thus be restored to the liquid in the container, said extending plug portions, within and outside of said container, each being provided with a plurality of capillary grooves in the surface thereof for the purposes set forth, the wall of said opening being upwardly and outwardly flared, said extending plug portions being interconnected by a relatively narrower neck portion disposed adjacent to said flared portion of said opening.

6. In a drop dispensing device of the character described, a container for liquids, said container having a normal opening, a closure member for said opening, said closure member having an opening smaller in size than said normal opening, a one-piece plug member in said closure opening, said plug member having a portion thereof extending outside of said container, the portion of said plug member in said closure opening being of such cross-sectional contour with respect to said closure opening as to provide a space therebetween through which, when the container is tilted, liquid from the container may pass to the surface of the said extending plug portion to ultimately fall off therefrom in the form of drops, said plug member being provided with a portion extending below said closure opening to a point within said container whereby when the container is held upright after use, the liquid remaining on the plug member will pass to the said last named extending plug portion within said container to fall off therefrom by the force of gravity and thus be restored to the liquid in the container, said extending plug portions, within and outside said container, being provided with a plurality of capillary grooves in the surface thereof for the purposes set forth, the wall of said closure opening being upwardly and outwardly flared, said extending plug member portions being interconnected by a relatively narrower neck portion, said neck portion being disposed adjacent to said flared portion of said closure opening.

7. As an article of manufacture, a drop dispensing closure for a container for liquids, comprising a plug member adapted to be frictionally held in a discharge opening in said container so that a portion thereof will project above said discharge opening, an open capillary groove in the outer surface of said plug member disposed in the said portion adapted to be frictionally held in said discharge opening to provide a capillary passageway for the ingress of air and the egress of liquid, and a chain of interconnected open capillary grooves in the outer surface of said member located in the said portion thereof adapted to project above said discharge opening, said chain of grooves communicating directly with said first named capillary groove and being so arranged as to gather up and store the liquid on said plug member until it overflows therefrom in the form of drops.

8. As an article of manufacture, a drop dispensing closure for a container for liquids, said closure comprising a one piece plug-shaped mem-

ber of relatively rigid material adapted to be frictionally received and held in a discharge opening of said container in such manner that a portion thereof will always project above said discharge opening, at least one lengthwise capillary groove in the outer surface of said plug member disposed in the said portion adapted to be frictionally held in said discharge opening to provide a capillary passageway for the ingress of air and the egress of liquid, and a chain of relatively angularly disposed and interconnected capillary grooves disposed in the said portion of said plug member adapted to project above said discharge opening, said chain of grooves and said lengthwise groove being directly and permanently in communication.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,478,891	Combs -----	Dec. 25, 1923
1,996,533	Weickel -----	Apr. 2, 1935
2,126,731	Burnham -----	Aug. 16, 1938
2,310,777	Giavotto -----	Feb. 9, 1943

FOREIGN PATENTS

Number	Country	Date
295,690	Germany -----	Feb. 13, 1916